Peculiarities of the Universal SQL Programming Toolkit for Increasing the Competitiveness of Enterprises

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Abstract
The article examines the issue of using new approaches to improving decision-making at the enterprise through the use of modern technologies for processing large volumes of information obtained by storing them in internal databases. It has been found that one of the main factors for increasing the competitiveness of enterprises is the use of an efficient and flexible database that can be used in enterprises of various types. This allows for quick, high-quality and comprehensive data analysis and effective decision-making process. It has been proven that the most convenient and universal method of information processing is the use of structured query language. SQL can be used in any type of enterprise with many types of databases. The article analyzes the types of SQL databases, substantiates the effectiveness of their use, and points out the weaknesses and strengths of each subtype. Recommendations are made on which the enterprise will have benefits on using SQL and the difficulty for personnel to master this programming language.

Keywords [1]
Database (DB), SQL, business analytics, enterprise, aggregate functions, information, programming language.

1. Introduction

Market situations in the countries of the modern world require enterprises to be very careful about their competitive positions and, as a rule, require the adoption of balanced decisions based on information received from both internal and external sources. However, in the globalized world, there is an extremely large amount of data, which, without proper layering and synthesis, can be not only redundant, but also harmful to the enterprise. Moreover, a well-established big data analysis system allows enterprises to develop an algorithm that will help take the right and effective management decisions, make high-precision forecasts and identify potential opportunities for enterprise development.

With the development of technology, it has become easier for enterprises to collect data not only from external sources, but also to efficiently store data in their own databases (DB). However, storage is only the first stage of working with a large amount of data. Afterwards, the company needs to structure, process and analyze this data. Therefore, companies need a tool that would allow them to quickly, qualitatively and affordably process a large amount of data in a short period of time.

With the development of new technologies and the computerization of work process, businesses invented dozens of programming languages that still today help businesses in their daily work. The main actor in working with large DBs in large companies is a business analyst (further BA). First task for business analysts is to provide information to decision-makers at various levels of the

organization. The information obtained in this way, significantly affects the company's business decisions. For this, BA uses software that stores and structures the information received, a programming language that simplifies work with large volumes of data, and visualization tools that allow you to transform data into familiar graphs and charts. According to a report submitted by Gartner Inc.[5], in 2023, companies that have promoted quality data storage, processing and analysis will have competitive advantages at the market. This is due to the fact that any decision made by the company's management will be based on the received data. However, a big problem arises, how exactly to process information that occupies terabytes of memory. This question arises more frequently due to the fact that every day enterprises store more and more data making its analyze a complicated task for any driven-by- data economy.
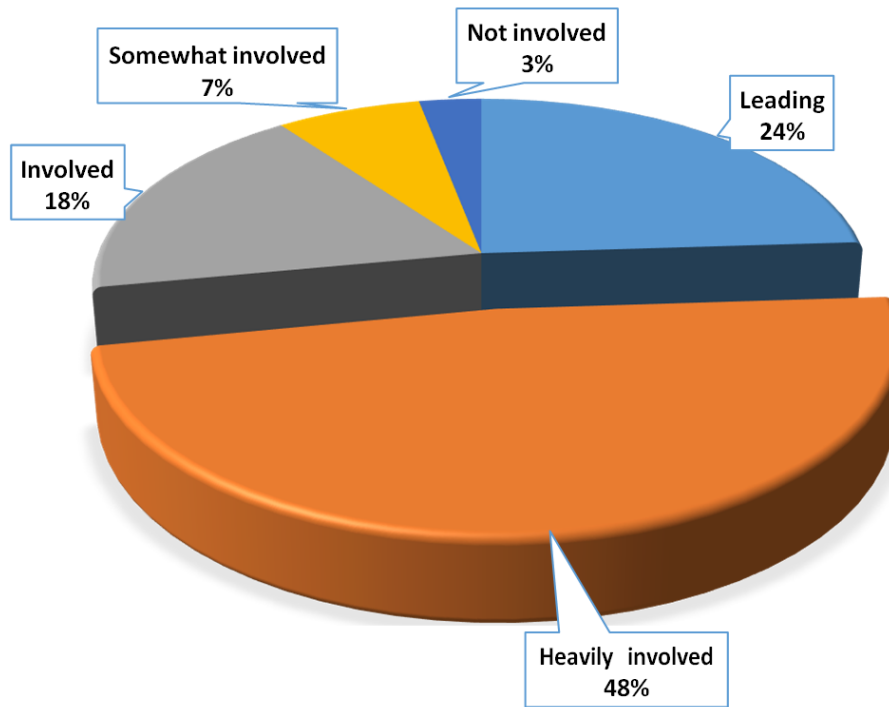

Figure 1: Percentage of Data & Analytics Leaders Involved in Digital Transformation Initiatives [5]

According to information provided in Gartner report, 72% agree that synergy data-driven business and IT transformation will have a huge effect on business activity. For modern enterprises that want effective solutions to increase competitiveness, the most important tool will be the company's ability to work with large volumes of data. Working with SQL is an attractive option for enterprises of any size to achieve effective data management, data analysis accuracy and data security. Knowledge of SQL enables business professionals to use data more effectively, improve processes, and stay ahead of the competition in today's data-driven corporate world. Actually, these and other circumstances determine the relevance and timeliness of this research and this article.

2. Analysis of recent research and publications

Issues of information provision of enterprises were considered in the works of Ayanesh Chowdhury "data mining using business intelligence and SQL" [3], Silva N.Y. "From Traditional Databases to Big Data" [8], Yolkina, A. S. "Peculiarities of using the SQL language for data processing" [9]. All these authors are deeply convinced that in our days, enterprise cannot take smart decisions without proper data mining and data analyze procedures. However all these authors made their research more from a technical point of view than an economic one. In the international environment, the topic of analysis of large databases arose in large companies such as IBM, Oracle, etc. Considering the fact that we live in era of information, it's highly valuable to get better understanding of how to make it simpler for companies work with big datasets and Dbs.

3. Main part

The Structural query language (SQL) is not new. It was developed in the 1970s by IBM researchers Raymond Boyce and Donald Chamberlin. At the beginning of its creation, it was known as SEQUEL. It was first mentioned in Edgar Frank Codd's paper "A Relational Data Model for Large Shared Databases" in 1970 [2]. Based on the ideas presented in the paper, Boyce and Chamberlin came up with SQL. The SQL became publicly available only a few years later [2].

An essential advantage of SQL is the ability to manage large amounts of data, so storing, accessing and modifying data in real-time is the most significant advantage of SQL. Business analysts using this language no longer need to manually sort vast amounts of data to get the necessary information and make informed decisions. In turn, managers can analyze trends more quickly, monitor changes in supply and demand, and make effective and timely decisions.

Using SQL, analysts can easily create complex models for analyzing and synthesizing information arrays, minimizing the number of errors and increasing the results' quality. Many aggregate functions (SUM, AVG, MIN, MAX, PERCENTILE, ROW_NUMBER, LEAD, LAG) enable analysts to perform calculations and provide the necessary results quickly.

SQL is a potent tool for implementing complex tasks. It can change the very structure of the DB, can insert data into other tables, change data in existing tables, delete data.

SQL uses a set of commands to manipulate data in DBs. Examples include SQL INSERT, which is used to add data to database tables; SQL SELECT, which retrieves data from database tables; and SQL UPDATE, which modifies existing database records. [1]

SQL is a universal tool for companies that can work in several different operating systems and platforms. The SQL is highly flexible and adaptable. It can manage data in various business areas, from large corporations to small businesses.

SQL is easy to use and has robust data protection capabilities in the face of cyber attacks. In SQL, there are different degrees of access control, which give the opportunity at the database level to manage the capabilities of users according to their rights. In addition, different backup copies of the SQL database can be created, which makes it possible for different structural units to obtain information from the production server and create their procedures for internal use without affecting the work of other departments. These features enable companies to protect confidential data.

The accessibility of SQL lies in its simplicity and uniqueness, which eliminates the need for long-term personnel training and allows them to start performing tasks in the shortest possible time. Another significant advantage of SQL is that companies can start using SQL without a significant investment due to the availability of free and open-source SQL databases.

The sphere of use of SQL is vast and diverse. In turn, Business-analyst cooperates with many departments within the company, helping them to fulfil their direct tasks. Example:

• Marketers. An important feature of SQL for marketers is the ability to segment data according to the necessary parameters. Marketers often use SQL to group customers based on their queries, personal information and characteristics. These features make it possible to group customers, highlight the necessary group and direct advertising promotion, targeting the needed class of customers. It enables the company to minimize costs and maximize the effectiveness of advertising.

• Financiers/accountants. Specialists in the field of finance and accounting constantly work with financial reporting. SQL makes it possible to combine many fragmented reports into several standardized formats. SQL helps them clean the data by combining different reports and exporting them to any convenient format (such as Excel spreadsheets or CSV).

• Engineers. Engineers or Data Support uses SQL to test new and existing products and find glitches and errors in the DB.

• Employees in the client service department. They often use SQL to analyze customers' transactions and requests to prevent contact with unscrupulous customers.

• Employees from the operations department. These employees use SQL to remove redundant or unnecessary data from business reports and reported income.

To facilitate the work of BA and add flexibility to SQL, the world's largest IT companies (Alphabet, IBM, Oracle and others) have developed software and new types of databases. These include MySQL, MariaDB, Oracle, PostgreSQL, MSSQL, Mongo DB, Redis, Cassandra,

Elasticsearch, and Firebase. According to a 2021 survey of StackOverflow users, MySQL is the most popular DB for SQL with 50% approve rate [6].

However, each DB has advantages and disadvantages, ranging from overpriced to too primitive in structure. The experience of our colleagues and many years of working with various databases has shown that, among all available databases for SQL, MySQL is the best.

Originally open source, MySQL is now owned by Oracle Corporation. Today, MySQL is the backbone of LAMP application software. It is part of the Apache, Perl/PHP/Python, MySQL, Linux stack. [6]
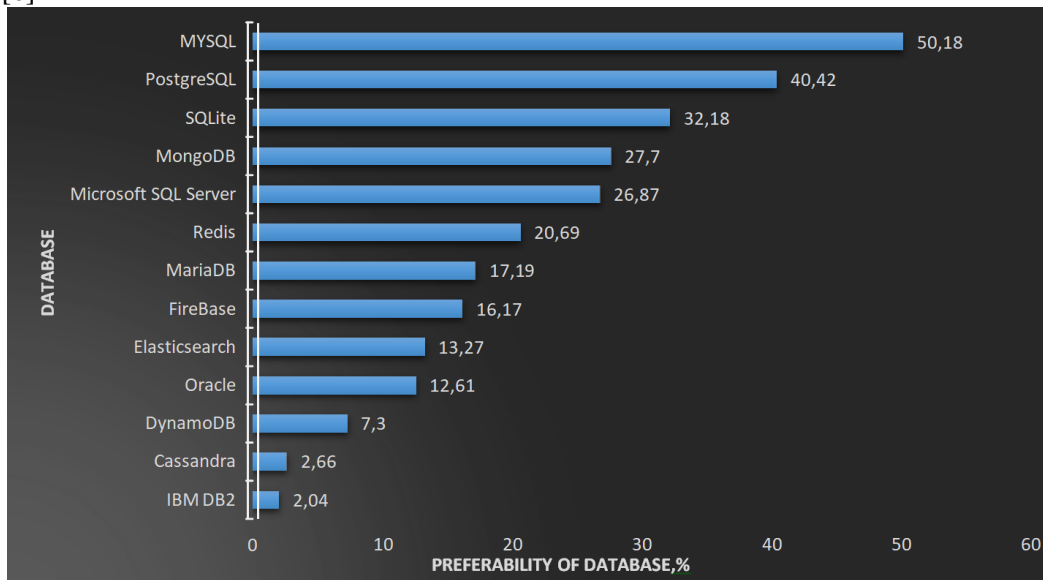

Figure 2. The most popular database systems. [6]

Working as a BA with the MySQL DB, the following significant advantages of this database for solving urgent issues in the enterprise's activities are worth noting. First, It has a simple syntax and straightforward logic in building queries in the DB. The structure and style of MySQL are also straightforward. MySQL is often used in tandem with the PHP programming language. In addition, MySQL is easy to use. For example, most tasks can be performed directly from the command line, reducing development steps.

The second significant advantage is cloud compatibility. Business-oriented and initially designed for the web, MySQL is supported by the most popular cloud providers [7]. It is available on leading platforms such as Amazon, Microsoft and others.

Another advantage is free installation. With a basic set of tools for individual use, MySQL Community Edition is a good option for small businesses.

However, there are also disadvantages when working with this DB. First of all, this is a question of scalability. MySQL was not designed with scalability built into its code. It is possible to scale MySQL, but it will require more engineering effort than any NoSQL DB.

It should be mentioned that MySQL doesn't have a full open code. Considering that MySQL cannot afford to fully support DBMS. As far as partially MySQL is under Oracle license, it cannot implement changes for its full code .

Another disadvantage is the limited compliance with SQL standards. The Structured Query Language has specific standards, but MySQL does not fully adhere to them. On the other hand, MySQL has few extensions and cool features that do not match to SQL standards. For small web applications, this is a small problem. Problems can arise when you have to change to other databases, which will most likely happen when the business has a plan to grow. [7]

There are also other quality options with databases for SQL that can be operated in production conditions, which are presented in comparative table 1.

According to information from Table 1, all databases have their own advantages and disadvantages. Each company has to choose DB based of its needs and capabilities. The most used system is MySQL about which we talked a bit earlier in this article. However, if company needs a

complex DB and there is no limit in finance, a good choice will be Oracle. It should be mentioned that this system supports few types of data. Oracle if fully licensed product that has compatibility with most of cloud technologies Having access to cloud technologies, Oracle is always adding new types of data analyzys to its broad functionality. Other DBs can used in specific situation when companies does not need complex solation.

Table 1

Advantages and Disadvantages of Major Databases as of 2023 [4]

Databases	Advantages of the database	Disadvantages of the database
MySQL	- Free installation. - Simple syntax and easy complexity. - Cloud compatibility.	- Scalability issues. - Limited compliance with SQLstandards
MariaDB	- Encryption. - Wide functionality. - High efficiency.	- Gaps between MySQL and MariaDB upgrade versions. - The community is still growing.
Oracle	- Innovation for the daily workflow. - Strong technical support anddocumentation. - Large capacity.	- High cost. - Resource-intensive technology. - Difficult learning curve.
PostgreSQL	- Excellent scalability. - Support for particular data types. - Easily integrated third-party tools. - Open source and communitysupport.	- Inadequate documentation. - Lack of reporting and auditingtools.
MSSQL	- Variety of versions. - End-to-end solution for businessdata. - Support for cloud databases.	- High cost - Vague and floating license terms - Complex setup process
MongoDB	- Simple data access, storage, inputand search. - Easy compatibility with other datamodels. - Horizontally scalable solution.	- High memory consumption. - Insecurity of data. - Complex process of interpreting requests into other languages.
Redis	- Quick solution. - Bulk data processing.	- Memory dependence on theprogram. - No query language or unionsupport.
Cassandra	- Data security. - Flexibility and possibleamendments.	- Slow reading. - The need for additionalresources.
Elasticsearch	- Scalable architecture. - Fast data processing	- Lack of support for multiplelanguages. - Limited consistent health checktools.
Firebase	- Friendliness to newcomers - Convenient access to data. - First-class documentation.	- Limited query capabilities. - Limited data migration.

4. Conclusions

Naturally, every enterprise strives to be competitive. Also, each has a corporate management system and an internal communication system with vertical and horizontal connections. If vertical

connections are established between managers and subordinates and transfer management decisions, then horizontal ones exchange information necessary for the implementation of internal business processes.

As the demand for fast data and technology increases, the expectation of combining technical skills with business acumen will become more common. Based on information above, SQL is one of the many programming languages adopted in many industries. Although creating and managing databases are not the primary functions of a business analyst, navigating SQL and understanding an organization's database structure will significantly increase a BA's effectiveness in communicating with technical teams. While most database development should be left to more technical roles, the organization benefits from a business analyst's ability to analyze SQL data and point technical teams in the right direction for further research.

We highly advise to use SQL as main language for "data mining". Data-driven decision-making using SQL allows companies to obtain and analyze a large volume of data, which in turn allows the most effective decision to be made. BAs can also use SQL to reduce the number of errors in data by grouping and testing hypotheses. This, in turn, allows business analysts to interact more effectively with IT teams, which makes it easier to achieve common goals. It also makes it possible to structure data manually by automating manual procedures. This enables companies to optimize processes and reduce costs. At the same time, for BA, knowledge of SQL can create new career opportunities and is a valuable experience in the labor market. Additionally, by checking all possible DB to use with SQL, we advise to use MySQL. It has free installation, simple syntax and compatibility with most cloud services.

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